Identification and collapse—the seeds of quantum superluminal communication

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We deeply analyze the relation between the identification of the classical definite states and collapse of the superposition state of such definite states during identification, and show that although identification rejects superposition, it needs not result in collapse, which then provides one possibility to achieve quantum superluminal communication.

The special role of measurement was first stressed by Bohr [1] in his complementarity principle to consistently interpret the non-classicality of the quantum world, then von Neumann [8] rigorously formulated the measurement process in his measurement theory involving projection postulate, but the inherent fuzziness in their definition of measurement or projection still exists, thus in order to end the infinite spreading of linear superposition, identification of the observer is implicitly resorted by von Neumann [8] and further advocated by Wigner [14] to break the linear superposition and generate the definite result, this may be the first statement about the relation between identification and collapse, it is simply if identified then collapse.

But, when facing the problem of quantum cosmology, this relation needs to be greatly revised, since for the state of the whole universe, no outside measurement device or observer exists, the special role of measurement and identification are essentially deprived, and the collapse process, if exists, must be the own thing of the wave function. The recent dynamical collapse theories [6] [9] [11] [2] [3] [10] [7] [13] [5]further revise the above relation, according to which the normal linear evolution and projection process of the wave function are unified in one revised stochastic Schrödinger equation, the collapse process is just the natural result of such evolution, thus the new relation is whether or not identified collapse will happen.

Although collapse needs not resort to the identification of the observer, and essentially an objective process, people still implicitly stick to the orthodox view, which asserts that after the conscious observer can identify the classical definite state, the collapse of the observed superposition state of such states must happen, and have still tried to demonstrate that according to the dynamical collapse theory, our brain just satisfies this condition [12], thus it appears that identification is essentially connected with collapse again, which is evidently not accounted for by the dynamical collapse theory itself, and de facto results only from the requirement of the orthodox interpretation of present quantum theory.

On the other hand, the wide acceptance of this orthodox view is also due to its confusion with the well-known conclusion that identification rejects superposition, which states that when the conscious observer can identify the measurement result of the superposition state, then collapse must happen, where the identification time denotes the time to identify the definite result for the measured superposition state, not for the measured classical definite state, while this conclusion is reasonable, since it only means that, on the one hand, if the observed superposition state is identified as a definite result or perception, namely the identification part of the conscious observer is in a definite state, then collapse must happen; on the other hand, if the identification part of the conscious observer is in a superposition state, then no definite perception exists, and no definite result is identified either. (It is difficult to accept that when identified as a definite result the superposition state still exists.)

In the following, we will physically re-analyze the relation between the identification and collapse on the basis of the dynamical collapse theory, and show that although identification rejects superposition, it needs not result in collapse, and their combination can result in quantum superluminal communication [4]. First, if the collapse process of the measured superposition state is completed before the conscious observer identifies the measurement result, which may result from the entanglement of the measuring device, then the identification is indeed irrelevant to the collapse process, since what he identifies is just a classical definite state; Secondly, if the collapse process of the measured superposition state is not completed before the conscious observer identifies the measurement result, then the identification process of the conscious observer will surely influence the collapse process of the measured superposition state, especially in an extreme situation, if the conscious observer is the only "measuring device", then the collapse process will be mainly determined by the identification process, we will further analyze this situation in detail.

On the one hand, as to the identification process of a conscious observer about a classical definite state, which is

one of the states in the above measured superposition state, there are mainly two physical properties characterizing the process, one is the entangled energy to identify the state, the other is the identification time after which the result is identified, and in general there exists no essential relation between them, but it is reasonable that with the natural selection, in which only the classical definite states are input to the conscious observer, the entangled energy will turn to be smaller and smaller, and the identification time will turn shorter and shorter.

On the other hand, according to the general dynamical collapse theories, if the entangled energy turns to be small, then the collapse time will turn to be long, then it is reasonable that with the natural evolution there must appear the conscious observer, for which the collapse of the observed superposition state indeed happens after the relevant classical definite state is identified, and his collapse time, or identification time, for identifying some superposition state is much longer than his identification time for identifying one of the definite classical states in the corresponding superposition state, so that such conscious observer can be conscious of the time difference of these two identifications, and distinguish the measured non-orthogonal single states, then it will be an easy thing to achieve quantum superluminal communication [4].

On the whole, we have shown that although identification rejects superposition, it needs not result in collapse, and this just provides one possibility to achieve quantum superluminal communication.

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